THE UNITED GRADUATE SCHOOL OF AGRICULTURAL SCIENCE
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CERTIFICATE

This is to certify that

Dr. Tuty Anggraini

has participated as a Guest Speaker in

International Symposium of Natural Products Chemistry and Applied Life Sciences in UGSAS-GU 2017

held at

The United Graduate School of Agricultural Science,
Gifu University, Gifu, Japan
March 2 to 3, 2017

Professor Masateru, SENGE
Dean
The United Graduate School of Agricultural Science,
Gifu University

THE UNITED GRADUATE SCHOOL OF AGRICULTURAL SCIENCE
GIFU UNIVERSITY

January 11, 2017

Dr. Tuty Anggraini
Lecturer
Andalas University

Dear Dr. Tuty Anggraini,

It is my pleasure to write and say thank you for your ongoing support of the "International Consortium of Universities in South and Southeast Asia for the Doctoral Education in Agricultural Science and Biotechnology (IC-GU 12). To carry out collaborative research and educational activities of the IC-GU12, I would like to invite you to the United Graduate School of Agricultural Science, Gifu University for the period from 26 February to 25 March, 2017. During your visit, I also would like to invite you to deliver a lecture to our students.

Accommodations and an economy class round-trip airplane ticket from your home country to Japan, as well as the necessary transportation fees during your stay will be covered by Gifu University.

I look forward to seeing you soon and hopefully our mutual collaboration will be fruitful and long lasting.

Sincerely,

Professor Masateru Senge
Dean
The United Graduate School of Agricultural Science,
Gifu University

The Antioxidant Activity of Colored Rice From Japan, China and Indonesia

Tuty Anggraini

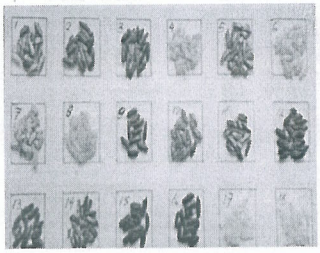
Andalas University
Indonesia

International Symposium of Natural Products Chemistry and Applied Life Sciences in UGSAS-GU 2017

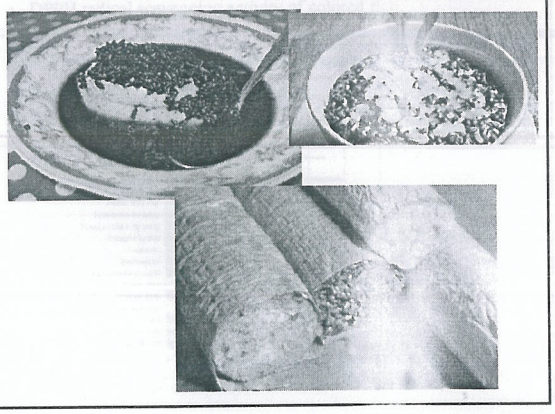
Introduction

- Colored rice, that is, black, red, and green rice, has been attracting much attention from rice consumers.
- Their characteristic pigments in kernels and in some cases, other plant parts
- Black and red rice cultivars are already available in common markets in many Asian countries and are frequently used as ingredients in colored foods

- Rice bran is a source of natural antioxidants that can be used as free radical scavengers
- Colored rice used as an ingredient in a variety food
- The intensive interest for colored rice has resulted in the emergence of many kinds of secondary products

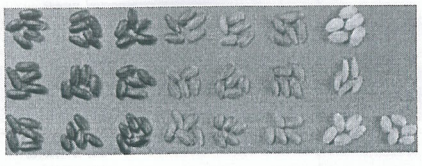


Kembang Loyang



Purpose

To determine the antioxidant activity, protein and amylose content of colored rice



Materials and Methods

Rice material : 22 cultivars from Indonesia, Japan and China (9 black rice, 9 red rice, 1 green rice and 3 white rice cultivars)

Method

- Color measurement : Colorimeter
- Antioxidant activity : DPPH ⟹ Blois method
- Total polyphenols : Folin-Ciocalteu reagent
- Anthocyanin
- Protein
- amylose

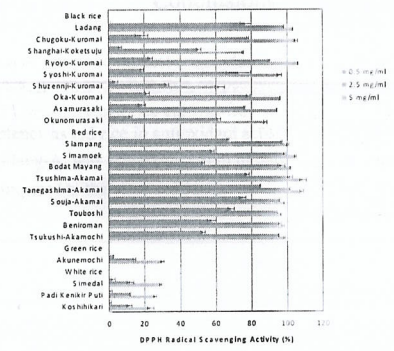
Results and Discussion

- Profile and kernel characters of the strains used in this experiment

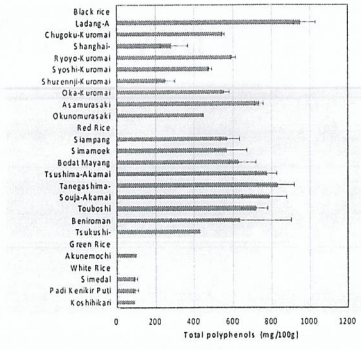
Rice group / Variety name	Hunters reflected color (mean, standard deviation) L*		a*		b*	
Black rice						
1 Ladang-A	22.9	2.8	6.6	1.6	5.1	2.6
2 Chugoku-Kuromai	18.6	1.6	2.9	0.8	0.8	0.5
3 Shanghai-Koketsuju	21.9	2.6	7.1	2.1	4.2	2.8
4 Ryoyo-Kuromai	20.9	2.4	6.2	2.3	2.6	2.2
5 Syoshi-Kuromai	21.7	2.5	5.9	2.4	3.5	2.1
6 Shuzennji-Kuromai	23.5	4.1	8.6	2.1	7.7	3.9
7 Oka-Kuromai	20.9	2.3	5.6	1.5	2.1	1.4
8 Asamurasaki	15.0	1.9	2.6	0.7	0.1	0.2
9 Okunomurasaki	16.4	1.5	2.9	0.9	0.4	0.5
Red rice						
10 Siampang	37.7	1.9	15.6	1.2	20.6	1.2
11 Simamoek	44.7	1.6	15.1	2.0	24.2	1.3
12 Bodat Mayang	38.8	1.8	16.5	1.2	22.5	0.8
13 Tsushima-Akamai	37.3	3.0	14.2	0.9	20.0	0.9
14 Tanegashima-Akamai	35.7	2.1	15.2	0.7	20.3	0.9
15 Souja-Akamai	38.3	2.3	14.7	1.1	19.9	1.5
16 Touboshi	42.5	2.6	14.1	1.1	21.9	0.7
17 Beniroman	36.1	2.5	14.8	0.7	20.9	0.9
18 Tsukushi-Akamochi	41.2	2.2	18.0	1.2	27.4	0.9
Green rice						
19 Akunemochi	62.3	1.9	−7.4	0.6	26.2	1.1
White rice						
20 Simedal	68.2	2.1	3.0	0.5	20.5	1.1
21 Padi Kenikir Puti	62.7	1.9	4.6	0.7	23.4	0.7
22 Koshihikari	63.3	2.4	3.5	0.1	22.8	0.8

Rice group / Variety name	Original country	Breeding History	Starch propert	Heading date	Grain shape (mm) Length	Width	Thickness	L/W ratio	1000-grain-weight (g)
Black rice									
1 Ladang-A	Indonesia	Native	N [9]	9.08	6.4	3.0	1.9	2.1	28.0
2 Chugoku-Kuromai	China	Semi-improved	G [7]	9.08	6.3	2.6	1.8	2.4	21.5
3 Shanghai-Koketsuju	China	Semi-improved	G	9.29	5.8	2.9	2.0	2.0	24.0
4 Ryoyo-Kuromai	China	Semi-improved	G	9.25	6.4	2.5	1.7	2.5	22.5
5 Syoshi-Kuromai	China	Semi-improved	G	9.22	5.8	2.9	2.0	2.0	27.9
6 Shuzennji-Kuromai	China	Semi-improved	G	9.27	5.8	2.9	2.0	2.0	24.0
7 Oka-Kuromai	China	Semi-improved	G	9.22	6.5	2.6	1.7	2.6	21.9
8 Asamurasaki	Japan	Improved [1]	G	8.06	5.2	2.7	1.9	1.9	20.5
9 Okunomurasaki	Japan	Improved [2]	N	8.06	5.7	2.9	2.0	2.0	25.5
Red rice									
10 Siampang	Indonesia	Native	N	8.27	6.5	2.7	1.9	2.4	27.0
11 Simamoek	Indonesia	Native	N	8.23	5.8	2.8	2.0	2.1	21.9
12 Bodat Mayang	Indonesia	Native	N	8.22	6.3	2.7	1.9	2.3	26.9
13 Tsushima-Akamai	Japan	Native (Shrine) [3]	N	9.06	5.1	3.0	1.9	1.7	21.9
14 Tanegashima-Akama	Japan	Native (Shrine) [3]	N	9.11	5.3	3.0	2.0	1.8	23.3
15 Souja-Akamai	Japan	Native (Shrine) [3]	N	9.06	5.7	2.9	1.9	1.9	23.7
16 Touboshi	Japan	Native indica	N	8.27	5.8	2.4	1.8	2.4	19.8
17 Beniroman	Japan	Improved [4]	N	9.06	5.0	3.0	2.1	1.7	22.8
18 Tsukushi-Akamochi	Japan	Improved [5]	G	9.02	5.1	2.6	2.0	1.8	21.1
Green rice									
19 Akunemochi	Japan	Native	G	-	4.4	2.8	1.9	1.6	17.3
White rice									
20 Simedal	Indonesia	Native	N	8.19	5.7	3.1	2.2	1.8	30.3
21 Padi Kenikir Puti	Indonesia	Native	N	9.13	6.4	2.1	1.7	3.0	18.5
22 Koshihikari	Japan	Improved	N	8.12	5.1	2.8	2.1	1.8	23.0

- DPPH radical scavenging activity of colored rice

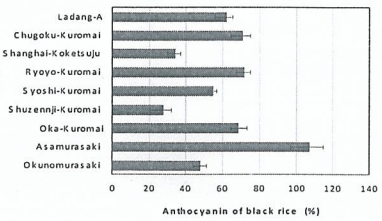


- Total Polyphenol



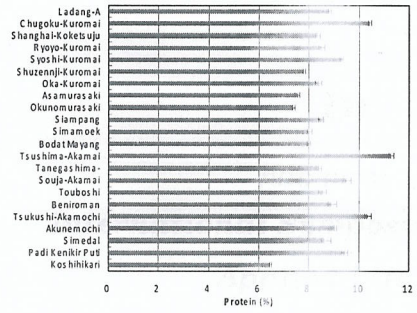
- The red rice cultivars contained about 4-7 times higher total polyphenol as compared to green and white rice

- Anthocyanin

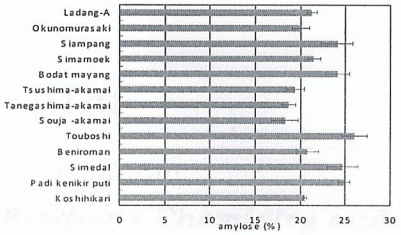


Anthocyanin compounds may be responsible for the major portion of the antioxidant activity of black rice

- Protein content of colored rice



- Amylose content of colored rice



Amylose content is one of the most important to determine rice quality

Conclusions

- Red rice showed highest antioxidant activities followed by black, green and white rice, respectively.
- Ladang-A, a black rice cultivar from Indonesia have the same potency as red rice in antioxidant activity.
- Ladang-A, was remarkably high in polyphenolic content compared to the other cultivars.

Thank you